SEMESTER END EXAMINATION APRIL-MAY, 2026

Course Name: B.Tech. **Semester: IV**

Paper Name: Engineering Mathematics-IV **Paper Code: NBS 402**

Time - 3 Hrs + 20 minutes per hour extra time for V.I. & examinees with writer. **Max Marks-70**

Instructions:

- The question paper consists of three sections namely A, B, C. All sections are compulsory.
- Section A- Each question carries **3 mark. All questions are compulsory**.
- Section B- Answer any **5 out of 7** given questions. Each question carries **7 marks**.
- Section C- Answer any **2 out of 3** given questions. Each question carries **10 marks**.
- Calculator is allowed for this paper.

Section – A
Multiple Choice Questions

1. Answer all the following questions. **5x3 =15**

i) Every Single valued analytic function f(z) of a complex variable z in a domain D satisfy
a) Laplace equation
b) Legendre's equation
c) Laguerre's equation
d) Liouville's equation

ii) Zeros of an analytic function f(z) are
a) Simple zeroes
b) Isolated singularities
c) Non-isolated singularities
d) isolated

iii) Value of integral $\oint \frac{zdz}{(9-z^2)(z_+i)}$, *where* c is the circle $|z| = 2$ equals to
a) $\frac{\pi}{2}$
b) $\frac{\pi}{3}$
c) $\frac{\pi}{5}$
d) $\frac{\pi}{7}$

iv) Which of the following series is not uniformly convergent
a) $\sum_{n=0}^{\infty} \frac{1}{\sqrt{n}}$
b) $\sum_{n=0}^{\infty} \frac{1}{n\sqrt{n}}$
c) $\sum_{n=0}^{\infty} \frac{1}{n^2}$
d) $\sum_{n=0}^{\infty} \frac{1}{n^p}$, $p > 1$

v) The Convergence rate of Newton's Raphson Method is .
a) 0
b) 1
c) 2
d) 3

Section – B
Short Answer Questions

2. Answer any five of the following questions. **5x7=35**

i. Examine the nature of the function

$$f(z)=\begin{cases}\dfrac{x^3y(y-ix)}{x^6+y^2}, & z\neq 0\\ 0, & z=0\end{cases}$$

Prove that C-R equations satisfied at z = 0 but f(z) is not analytic at z=0.

ii. Show that the function $u=\frac{1}{2}\log(x^2+y^2)$ is harmonic. Find its harmonic conjugate.

iii. Expand the function $f(z)=\frac{1}{z^2-3z+2}$ in the region (a) $|z|<1$ (b) $|z|>2$.

iv. Find the residue of the function $f(z)=\frac{z^2}{(z+1)^2(z-2)}$ at its poles.

v. Prove that (a) $\mu^2=1+\frac{1}{4}\delta^2$ (b) $E^{\frac{1}{2}}=\mu+\frac{1}{2}\delta$

vi. Find the smallest root of the equation $x^3-2x+0.5=0$. By using Newton's Raphson method.

vii. Given

X	1	2	3	4	5	6	7	8
F(x)	1	8	27	64	125	216	343	512

Find f(7.5).

Section – C
Descriptive Questions

3. Answer any two of the following question. **2x10=20**

i) (a) Evaluate the following integrals using residue theorem

$\oint\frac{(4-3z)}{z(z-1)(z-2)}dz$ where c is the circle $|z|=\frac{3}{2}$.

(b) Evaluate $\int_0^1\frac{dx}{1+x^2}$ by using Simpson 1/3rd rule by dividing the range into 6 equal parts . Hence Obtain the approximate value of .

ii) Using Euler's method solve the differential equation in six steps:

$\frac{dy}{dx}=x+y$, y(0)=1. Choosing h=0.2.

iii) Apply Runge-Kutta method of fourth order to solve $5\frac{dy}{dx}=x^2+y^2, y(0)=1$ and find y in the interval o<x<0.2, taking h=0.1.

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